

# NOTES

ON THE

## HABITS OF COLEOPTEROUS INSECTS

BY G. P. GIRDWOOD, M.D.,

M.R.C.S.E., L.C.G. & S.L.C.

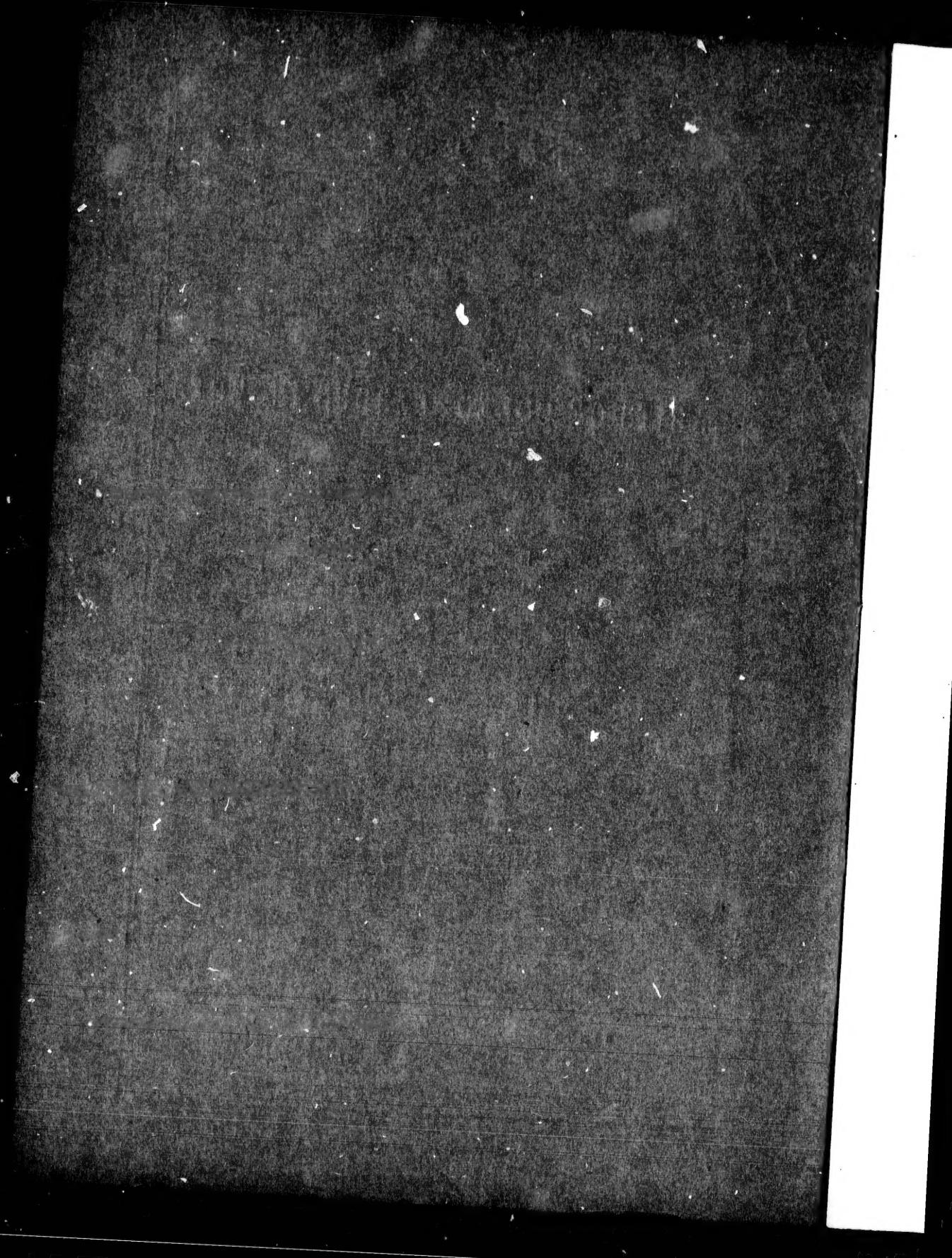
READ BEFORE THE NATURAL HISTORY SOCIETY

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*Mr. President, Ladies and Gentlemen*—As we are in the habit of judging of a man by his works, so may we judge of the Creator of the Universe by his works, not that I mean we should sit in judgment upon the being, who was the author of all things and in whom we live and move and have our being, but that in examining and scrutinizing his works we may judge of the majesty and power, and wisdom of him who fashioned man in his own image. The study of natural history is but the study of the book of nature, and in truth the study of the Creator himself. The book of nature is divided, if I may use the expression, into three volumes, namely, the animal, vegetable, and mineral kingdoms, in all of which we find evidences of the vast resources, and forethought and wisdom of God.

We find these three divisions of this world mutually dependent upon one another and forming a harmonious whole.

We find a life in each, that life in each commencing in an individual unit so to speak, and passing by gradations, almost imperceptible, to more and more complex forms.

In the animal kingdom, which is the volume which we have to open to-night, we find all animal life commencing in a single cell, a spherical bladder of organized matter, yet matter, possessed of the same characters as we find in the mineral kingdom, and indeed borrowed for a time from that kingdom, and which, after passing through the various stages and transformations, developments and decay, constituting the phenomena to which we have given the term life, is again returned to the mineral kingdom from which it was borrowed, there to pass through other changes until it is again borrowed for some future individual.

All members of this animal kingdom pass through successive stages of progressive existence from this simple form of a sphere till they attain their full development as adult individuals of their species, perform their duties in the economy of nature, and pass away to make room for succeeding generations.

The whole animal kingdom itself exhibits a successive progressive development from this simple form to man. The race we in our classification put at the top of the tree.

Previous enquirers into this volume of the book of nature divided and classified this volume into leaves; these leaves are the different races of animals,—one of which forms the subject of the few remarks I am about to address to you to-night.

The classification of animals is according to the amount of their development. The articulated branch of the animal kingdom contains animals composed of simple rings more or less similar to one another, which contain and support the organs necessary to animal life.

According to the method in which this plan of structure is exemplified, articulated animals are divided into three classes. Those whose

Body is permeated by air vessels. Insecta.

Body without air vessels.

Thoracic region distinct from abdominal. Crustacea.

The thoracic region not distinct. Vermes.

The class Insecta are again divided, by subordinate modifications in the plan of structure, into three sub-classes:

Head, thorax, and abdomen; distinct legs, 6 Insecta.

Head, thorax usually agglutinated; legs, 8. Arachnida.

Head distinct; legs numerous. Myriopoda.

The first sub class Insecta alone occupy our attention at present.

The word insect, which denominates this sub-class, is derived from the Latin language, and means cut into or notched. And is designed to express one of the chief characteristics of this group of animals, whose bodies are marked by several cross lines, or incisions.

The parts between these lines are called segments or rings, and consist of a number of jointed pieces more or less moveable on each other.

Insects have a very rudimentary brain. And instead of the spinal marrow of the higher orders

of animals, have a knotted cord extending from the rudimentary brain to the hinder extremity of the body, and numerous white filaments pass from this cord and from the brain, forming a nervous system.

Within their bodies they have numerous tubes for the passage of air, which supply the want of lungs and carry the air through their bodies. They do not breathe through their mouth, but through small holes placed along the sides of the body, called spiracles, usually nine in number.

They have a heart, which, from the fact of their pairing off, seems to be susceptible of the influence of the mischievous little god, Cupid.

However, this heart is a long tube lying under the skin of the back, and having holes on the sides for the admission of the juices of the body, which are prevented from escaping again by valves, which close over them. Moreover, this tubular heart is divided into several chambers by transverse partitions, in each of which there is a hole, shut by a valve, which only allows the blood to flow in one direction—from behind forwards. The blood of insects is a colourless or yellow fluid. There is no complete system of circulation, but the blood is forced by the heart forward into the head and escape into the body, where it mixes with the nutritive juices which filter through the intestines, and, penetrating through the crevices of the flesh, finds its way to the sides of the air passages and returns again to the heart, fitted to nourish and maintain life. In all this we find an analogous process to the circulation in all other animals.

Insects are never spontaneously generated, but are produced from eggs, except in a few cases where the eggs are retained within the body until the young are ready to escape.

Most insects are subject to very great changes of form during their lives. Taking a moth or butterfly as the type, we find the insect 1st in the condition of an egg; 2nd in the condition of a caterpillar; 3rd in the condition of the pupa, or grub; 4thly in the condition of the fully developed insect.

These changes of form, or metamorphoses as they are called, might cause the same insect to be mistaken for as many different animals.

After the egg has been hatched, we observe three distinct periods in the life of an insect, more or less distinctly marked by corresponding changes in form, power and habits.

In the first period of infancy an insect is technically called a larva, a word signifying a mask, because therein its future form is more or less masked or concealed.

In this first period, which is much the longest, the insects are always without wings, pass most of their time in eating, grow rapidly, and usually shed their skins repeatedly.

In the second period they entirely lose their previous form, take no food, and remain at rest hidden away somewhere in a death-like sleep—in this condition called the pupa, from a slight resemblance that some of them present to an infant trusted in bandages, as was the custom among the Romans.

At the end of this second period insects again shed their skins, and come forth fully grown and with few exceptions provided with wings. Thus they enter upon their last or adult state, wherein they do not increase in size, and during which they provide for a continuation of their kind. This period is usually but short, most insects dying immediately after their eggs are laid. In winged or adult insects, two of the transverse incisions with which they are marked, are deeper than the rest, so that the body seems to consist

of three principal portions. The 1st the head; the 2nd or middle portion Thorax or chest; the 3rd or hindmost portion the abdomen. The head supports the eyes, the mouth, and the antennæ or organs of hearing. The eyes of adult insects, though apparently two in number, are compound, each consisting of a great number of single eyes, closely united together and incapable of rolling in their sockets.

Near to the eyes are two jointed members, the antennæ corresponding in situation with ears in other animals, supposed to be connected with the sense of hearing or of touch, or of both combined.

The mouth in different insects varies according to the food they live on, some being provided with a biting or chewig apparatus, whilst others are provided only with a suction apparatus. The parts of the mouth are an upper and under lip, two nippers or jaws on either side moving sideways, and four or six little jointed members called palpi or feelers, whereof two belong to the lower lip, and one or two to each of the lower jaws.

These parts are altered and modified in different insects, and form a mode of distinguishing one class from another. In some, these parts are agglutinated to form a tube for sucking up food; in others, for piercing, and then sucking. The parts belonging to the thorax or chest are the wings and the legs. The former are two or four in number, and vary greatly in form and consistency, in the situation of the wing, bones or veins, as they are generally called, and in their position or the manner in which they are closed or folded when at rest. The under side of the thorax is the breast, and to this are fixed the legs, which are six in number. The parts of the legs are the hip joint, by which the leg is fastened to the body; the thigh (or femur), the shank (or tibia), and the foot; the latter consisting sometimes of one joint only, more often of two, three or 5 pieces called tarsi, connected end to end, like the joints of a finger, and armed at the extremity with one or two claws.

The abdomen, or hindmost part of the body, and, as to size, the principal part, contains the organs of digestion and other internal parts; and to it belong the piercer and sting, where they exist.

An English entomologist has stated that, on an average, there are six distinct insects to one plant. This proportion is probably too large for this country. There are about 1200 flowering plants in this country, and we may estimate the number of species of insects at nearly 5000, or in proportion of  $\frac{1}{2}$  to a plant. To facilitate the study of such an immense number, some kind of classification is necessary. The basis of this classification is founded upon the structure of the mouth; in the adult state, the number and structure of the wings, and the transformation. The first great divisions are called orders, of which the following seven are generally adopted by naturalists:—

1st. Coleoptera: Beetles, Insects with jaws and two thick wing covers, whence they derive their name; two membranous wings.

2nd. Orthoptera: Crickets, Grasshoppers, &c., with jaws, and parchment wing covers; two membranous wings,

3rd. Hemiptera: Bugs, Locusts, &c., with a horny beak for suction, 4 wings, the upper one being small and membranous.

4th. Neuroptera: Dragon Flies, &c., with jaws, and four netted wings.

5. Lepidoptera: Butterflies and Moths, mouth with a spiral sucking tube, and 4 wings, covered with branny scales.

6th. Hymenoptera : Wasps, bees, &c., insects with jaws, 4 wings veined.

7. Diptera : Mosquitoes, Gnats, Flies, &c., with a horny or fleshy proboscis, two wings only.

With this first order (Coleoptera) we have to deal. They have two membranous wings, concealed by a pair of horny cases or shells, meeting in a straight line on the top of the back and usually having a triangular or semi circular piece, called the scutel, wedged in between their bases. Hence the name, signifying wings in a sheath. The horny covering is called elytron. The order Coleoptera is divided again, according to differences of formation, into 45 families, which are again subdivided into genera and species. These are distinguished from one another by various forms of the antennæ, the mouth, the tarsi, &c.; but, independently of these, the different families have peculiar shapes, some of which I have had drawn so as to point out the characteristic shapes of these tribes of beetles. The food of beetles has been one means of classifying them; thus we have :

Geod-phaga, earth eating beetles.

Hydrophilidae, water beetles.

Necrophaga, death eaters.

Brachelytra, do do.

Lamellicornes, dead wood, &c.

Serenoxi, plant eaters.

Malacodermata, fire-flies, also plant eaters.

Heteromera, living on fungi and decayed wood.

Longicornes, borers.

Phytophaga, living on live animals.

In this sort of classification we find the most brilliant coloured insects living upon flesh, either dead or living. In the nourishment of beetles something more than the mere preservation of the individual seems to have been designed, and in many instances it would appear as if some were created for the express purpose of consuming unhealthy organized material. Thus we find the carrion beetles beneficial to man by devouring noxious insects, and even carrion, destroying decayed animal substances which would otherwise prove a fertile source of unhealthy exhalations. In Egypt these beetles are very large and powerful, and numerous, and one was in ancient times of so much use that these people deified him. One of the dung beetles, which still goes by the name of Scarabæus Sacer, whose conformation is beautifully adapted to the duties he has to perform in life; his strong limbs, and his great shovel on the front of his head, enable him, and they set to work in numbers, alight on some piece of offal, to dig away the sand around and under it, and when they have made a hole deep enough the mass falls down into it, and then they shovel up the sand and cover it up and lay their eggs, and have stored up a cellar full of food adapted for their young when they are hatched. Beetles which feed on leaves, wood, fruits and grain, are herbivorous, and are generally noxious to man; but here we find Nature's great doctrine of compensation fully carried out. If there be many genera of insects, principally the case among noxious butterflies, so prolific that if allowed to increase they would devour all the vegetables, and so bring about a famine, we at the same time observe that the Great Ruler of the Universe has prevented their increase by making them the proper food for others. But besides the enemies these insects have among their own order, they are the food of other orders, such as birds; and if we destroyed all the caterpillars, and the vegetable-eating Coleoptera, we should have our woods destitute of birds, and

would welcome again these insects if they would bring back the birds with them.

The first division named, the Geodphaga, are represented by this cicindela hexagonata, are a rapacious, hungry set of fellows, very quick in their movements, lying in ambush under stones, and pouncing on their prey, which they grasp with their powerful claws in front of their mouth; others run over the sands, and are on the look-out for the larvae of other insects, which, lying in concealment until their sleep-life, or pupa state is over, become an easy prey to their enemies; others again may be seen running up and down leaves and branches in search of a fine fat caterpillar to satisfy his craving appetite. They are splendid in colour; they fly very fast, but not far; they are difficult to catch, but well repay the trouble of taking. The elytra, or wing covers, may be made use of to adorn ladies' dresses, or the whole beetle may be used for the same purpose. No work of art can compare in beauty with the creations of Nature.

The next order, the Hydrophilidae, represented by *Diiscus*, are most useful to man; they inhabit for the most part the water but frequently fly about at night. I have taken many of them at night when sitting with my window open with a lamp watching on a summer evening for moths and any nocturnal visitor. They live on decaying vegetable matter and the larvae of other insects whose young inhabit the water; they thus act as purifiers of that element, and at the same time prevent the too rapid increase of other insects.

The next tribe, the Necrophaga, represented by the *Sylpha Marginata*, are carrion beetles, are useful to man in removing all sorts of refuse, may be found in the carcasses of dead animals, and when disturbed run out in all directions. Some of these are also remarkable for the brilliancy of their colouring; and although they live under such disadvantageous circumstances, they manage to keep themselves clean in appearance, and never seem to allow any of their food to stick to them, from which we may learn a good lesson, that in the midst of dirt we may keep ourselves clean.

The Brachelytra, or fourth tribe, and the fifth tribe, Lamelli Cornes, or flat-horned beetles, of which *Staphylinus Villosus* and *Scarabæus Sacer* may be taken as examples, may fairly be considered with necrophaga, for their habits are much the same, and may be called scavenger beetles. They are armed with strong jaws for separating the food. Among these we find some of the largest specimens of beetles; the larvae of these live underground, and feed upon such food as their progenitors have been kind enough to lay up for them. Amongst the members of this class are to be found a family of beetles called Dermestidae; they live on decaying matter, but not always on decaying matter, for the grocer finds great enemies in these little fellows; they are very ravenous, and eat a great deal; they have a peculiar taste for ham, in which I think a good many others will agree with them; but if the grocer finds an enemy, the anatomist finds a friend, and my friend Mr. Buckland used to keep a select staff of Dermestes for the purpose of cleaning his skeletons; they eat away all the flesh, and leave nothing but the bones. Some of these larger kinds of larvae were considered by the ancient Romans a great delicacy; and to this day in the West Indies, the inhabitants eat the palm worm, and I was assured by a friend who had been in the West Indies that they are a great delicacy. It is disgusting looking, fat, white worm, with a

black head, from three to five inches long. He usually lives in the cabbage palm (areca olaracea) and afterwards changes into a black weevil two inches long, of which tribe I have yet to speak.

In New Zealand the larva of a species of cock chaffer is eaten after dinner as a delicacy, cooked like marrow and eaten on toast. I dare say they may be very good, and we have bible authority for the eating of beetles, for I find in the 11th chapter of Leviticus and the 22nd verse, the following words:—"Even these of them ye may eat, the locust after his kind, and the bald locust after his kind, and the beetle after his kind, and the grasshopper after his kind."

The sternxi or buorstrans come next. They are of beautiful metallic lustre, often with brilliant colours, intermixed there are many species of them, they live on leaves of plants, and the larvae penetrate the wood of trees, upon which they live, and when this stage of life is nearly completed they place themselves with the head outwards, and when the transformation is complete they have only a thin layer of bark to eat through, and out they go, fully dressed, into the sun. They are sly fellows, these buorstrans, for when you approach them to take them, they let go their hold and fold up their feet and fall to the ground, as if dead, and often you are disappointed of your prize. They fly about by day and secrete themselves in old stumps, &c. by night, the different species inhabit different trees, the cherry, the poplar, the butter nut, &c.

The 8th division, the malacodermata are a class of beetles, of great interest, and great beauty. They are the fire fly, their elytra and skin generally is much softer than that of other beetles, they are vegetable eaters, but amongst them are several genera of use to man and used in medicine, as the various forms of blistering flies as they are called, the Spanish fly as it is called, belongs to a genus of this division, they do some mischief in the way of destroying the plants they feed on, but are so useful that I think we will forgive them this little injury they do us.

Heteromera, the eighth division I have given, are useful in removing decaying wood, and one peculiar family are specially useful, called the Bolitophagi or fungus eaters. They live entirely upon fungi, and among them are some very strange shapes. With these we may take a nearly allied class, the Elateridae, or spring beetle, called by our neighbours the lightning spring bug, represented by the Elater occulatus; so called from two large black spots on the thorax resembling eyes. These beetles when held give a peculiar snap, accompanied by a sharp snap, and readily slip out of your fingers. Their habitat is the bark of trees, or between the bark and the wood. They do mischief to the trees by separating the bark from the wood.

The Longicornes, 9th on my list, are a very destructive set of gentlemen. They are for the most part handsome fellows with long antennae. It is difficult to know what they do with these long horns. It seems as if they must be very much in their way. Some of them are very large. They lay their eggs in the bark of trees, and the grubs or larvae traverse the wood of the tree in different directions, causing those large round or oval holes we so commonly see running through the timber. They may be represented by Monochamus confusor, of which Mr. Billings says he has seen as many as a hundred on one single pine tree. Together with these the weevils may be taken. These are a peculiar class of beetles called Rhincophora, from their carrying a peculiar trunk on their heads, which aids them

in boring through the bark to deposit their eggs. It is the bava of one of these that is eaten in the West Indies. They are very destructive to some of the fruit trees, and one has been denominated from his habitat the pea weevil (Bruchus Pisi). Mr. Harris, in speaking of this insect, says:—

Few persons, while indulging in the luxury of early green peas, are aware of how many insects they unconsciously swallow. When the pods are carefully examined, small discoloured spots may be seen with them, each one corresponding to a similar spot on the opposite pea. If this spot on the pea be opened, a minute, whitish grub, destitute of feet, will be found there. It is the weevil in its larval form, which lives upon the marrow of the pea, and arrives at its full size at the time that the pea becomes dry. This larva or grub then bores a round hole from the hollow in the centre of the pea quite to the hull, but leaves the latter and generally the germ of the future sprout untouched. Hence these buggy peas, as they are called by seedsmen and gardeners, will frequently sprout and grow when planted. The grub is changed to pupa within its hole in the pea in the autumn, and before the spring casts its skin again, and becomes a beetle, gnaws a hole through the thin hull, in order to make its escape into the air, which frequently does not happen before the peas are planted for an early crop. After the plants have flowered, and while the pods are young and tender, the peas within them are beginning to swell, the beetles gather upon them, and deposit their tiny eggs, singly, in the punctures or wounds which they make in the surface of the pods. This is done mostly during the night or in cloudy weather. The grubs, as soon as they are hatched, penetrate the pod, and bury themselves in the opposite peas, and the holes through which they pass into the seeds are so fine as hardly to be perceived, and are soon closed. Sometimes every pea in a pod will be found to contain a weevil grub, and so great has been the injury to the crop in some parts of the neighbouring States that the inhabitants have been obliged to give up the cultivation of this vegetable. These insects diminish the weight of the pea in which they lodge nearly one half, and their leavings are fit only for the food of swine. This occasions a great loss where peas are raised for feeding stock or for family use, as they are in many places. Those persons who eat whole peas in the winter after they are raised run the risk of eating the weevils also; but if the peas are kept till they are a year old the insects will entirely leave them. The pea weevil is supposed to be a native of the United States. It seems to have been first noticed in Pennsylvania many years ago, and has gradually spread from thence to New Jersey and other States, and is now common in the south of Europe and England. The insect is limited to a certain period for laying its eggs; late sown peas, therefore, escape its attack.

The larvae of these boring beetles, like the pea weevil, which inhabit trees, come near the surface of the tree, and, of course, leave a hollow space under the bark. The woodpecker, tapping with his beak, finds out these hollow spaces, and works away till he makes a hole through the bark and fetches out the larvae he is in search of, affording us another example of the law of compensation in nature, and preventing the too great increase of these destructive insects.

The last of my list are the phytophages, or beetles who live on living things. They are represented well by the crysococcus aureatus, a most beautiful green beetle, with a brilliant golden hue. They run up and down the plants,

and prey upon "a aphides - small green insects that suck the juice of the plant. This class of beetle is very useful in this way. The ladybirds belong to this order. They have been long held in estimation, and are called in Germany "lady-beetles" of the virgin, by the French, cows of the lord, or anima's of the virgin, these have been recommended as a sovereign remedy for tooth-sche. They are to be smashed up and put into the tooth, whether or no they are efficacious, I cannot tell; any one may readily try it for himself.

I have given you a few remarks about the mode of determining and classifying insects, and upon some of their lives and habitats, those who

wish to collect these beautiful little animals, can do so readily. It is only necessary to supply yourself with a small wide-mouthed bottle of spirit of wine, a box of pins, a few pieces of cork and a cork-lined box to put your collection in. You will find the time spent is not wasted. It is a pleasant occupation in long winter nights to arrange them, and induces rambling amongst the woods in summer, whereby you will obtain a stock of health and strength. From their habits we may learn many useful hints: and in watching their habits and instincts, we may learn to appreciate the creations of an All-wise Providence.